THE
ATMOSPHERIC RESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

What is a snowflake?

by Bruce Boe

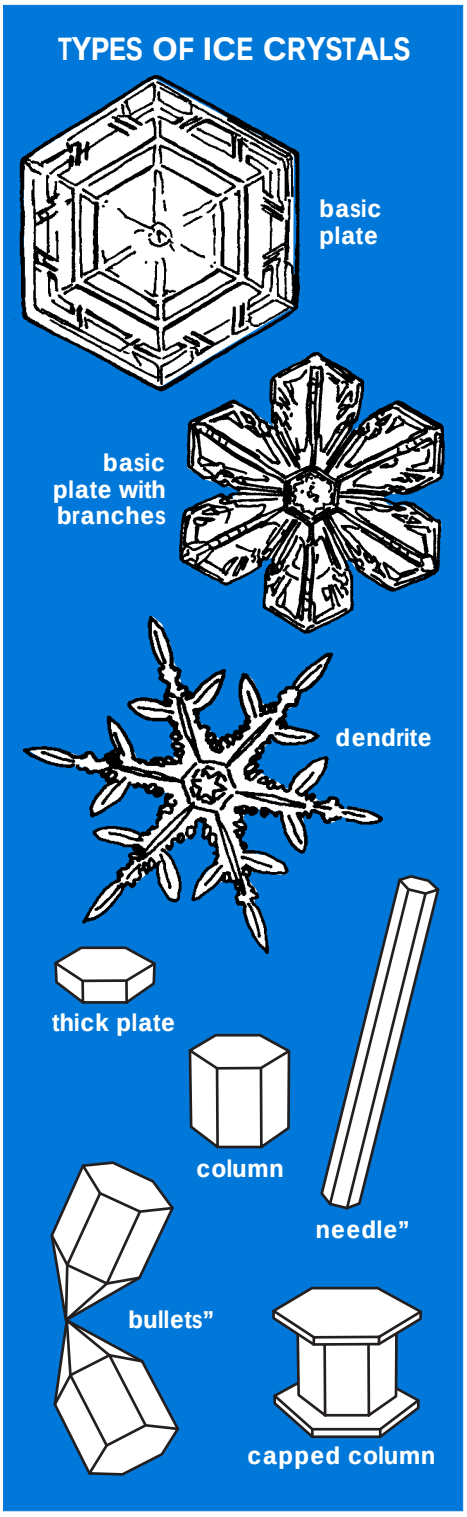
Most of us have heard that no two snowflakes are exactly alike. To decide if this is true or not, we first have to know what a snowflake is.

As defined in the *Glossary of Meteorology*, a snowflake is "an ice crystal or, much more commonly, an aggregation of many crystals which falls from the sky." The *Glossary* continues, reporting that "snowflakes made up of clusters of crystals may grow as large as three to four inches in diameter, often building themselves into hollow cones falling point downward. In extremely still air, flakes with diameters as large as ten inches have been reported." Wow!

As far as these large snowflake aggregates are concerned, we can be pretty certain that no two are alike — probably no two are even close. However, when we get down to examining single-crystal snowflakes, this is less clear. Let's look at why ice crystals are shaped the way they are.

Ice is simply water molecules cooled to the point of "lock up," that is, to the point that the molecules are moving slowly enough that they cease moving randomly relative to each other (as in a liquid or gas), but instead lock into the very orderly crystal form we know as ice. The transition from liquid to solid we call *freezing*; the transition from gas (invisible water vapor) to solid ice we call *deposition*. It is deposition that makes snowflakes.

The basic shape of ice crystals results from the angles of the molecular bonds that hold the two hydrogen atoms to the single oxygen atom. These angles dictate that any ice crystal growing freely by deposition (the transition from water vapor directly to ice) will have six sides in one axis, and in general, two sides in the other.



The simplest form is a simple, hexagonal crystal with flat sides. This crystal is called a *plate*. If conditions change slightly, the basic plate shape may begin to grow broad branches — six of them.

If conditions are slightly more different, a delicate, finely branched crystal called a *dendrite* may grow. Still other conditions can produce flat, *thick plates*, short *columns*, "*bullets*," long slender columns or "*needles*," or even *capped columns*. Each of these shapes results from variations in humidity and temperature within the cloud.

Because these conditions are always changing, the possible combinations are endless — hence the idea that no two crystals can be the same. However, with the simplest of these shapes such as the basic plate or simple column, one crystal usually looks pretty much like another. ■

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